convex, smooth. Antennae not quite as long as the body, segments only a little thicker at the distal end than at the base, second segment as long as the third, the fourth longer than the third, the fifth still longer than the fourth. Pronotum nearly twice as wide as long, sides nearly parallel, median line indicated, surface nearly smooth. Elytra not reaching the coxae of the hind legs, with a rugose effect. The last sternite (Fig. 9) oblong-oval with a rather deeply and broadly emarginated distal end, in the normal condition, covered more than halfway by the next to the last sternite. The punctate field in the basal half is much less strongly chitinized than the rest and is semitransparent. Length: 2.5 mm.

Type.—Holotype male, U.S.N.M. 62356.

Type locality.—Rio de Janeiro, Brazil. Specimen collected on January 3, 1920, by E. G. Holt.

Apparently this species must be placed in the vicinity of *M. brasiliensis* (Pic) (described as *Malthodes* but very probably belonging to *Maltypus*). *M. brasiliensis* has yellow pronotum and ventral aspect, which parts are dark-colored in the new species.

Maronius centromaculatus, n. sp.

Male. Black-brown, bases of the antennae, the cheeks and frequently also the whole anterior part in front of the antennal bases, the apices of the elytra and the abdomen except the last segment, yellow. Pronotum yellow with a large, nearly rectangular, brown spot which is often somewhat narrowed toward the base and touches neither the basal nor the anterior margin. Front legs frequently somewhat paler. Head with the eyes as wide as the pronotum, front nearly flat, surface nearly smooth. Antennae not very long, the third segment not quite twice as long as the second, the fourth the longest, somewhat longer than the third, the fifth only a little shorter than the third. Pronotum somewhat wider than long, sides nearly parallel, weakly sinuate toward the middle, surface weakly transversely impressed, nearly smooth, pubescence fine. Elytra hardly reaching beyond the coxae of the hind legs, each apex rounded off, an oblique fold on either side beginning under the humerus, running posteriorly toward the middle of the apex, becoming extinct before the apex, surface with an irregularly finely rugose effect. Length: 4–4.5 mm.

Type.—Holotype male, U.S.N.M. 62357. Allotype in the collection of the United States National Museum, paratype in author's collection.

Type locality.—San Salvador de Bahia, Brazil. The specimens were collected on May 28, 1915, by P. G. Russell.

Related to *M. limbatus* Pic which is similarly colored but readily separated therefrom by the proportions of length of the antennal segments, the coloring and formation of the elytra. In *limbatus* the fourth antennal segment is nearly twice as long as the third, the yellow coloring of the apices of the elytra shows up on the sides as a narrow border to beneath the humeral calli and the fold on the elytra is hardly indicated. In *centromaculatus* the fourth antennal segment is only a little longer than the third, the yellow coloring on the elytra is restricted to the apices, and the fold on the elytra is strongly developed.

ZOOLOGY.—*Two new subterranean shrimps (Decapoda: Caridea) from Florida and the West Indies, with a revised key to the American species.* Fenner A. Chace, Jr., U. S. National Museum.

Special thanks for the material and notes on which the following descriptions are based are due to the collectors: Dr. N. T. Mattox, of the University of Southern California; Capt. Merle L. Kuns, of the U. S. Air Force; and Robert B. Cumming, of the University of Florida.

The discovery of two additional shrimps from American subterranean waters and several recent nomenclatural changes (Holthuis, 1947, 1949, and 1950) have made the last published synopsis of these species (Chace, 1943) inadequate. A revised key is therefore offered below.

Typhlatya monae, n. sp.

Fig. 1

Holotype.—Female; Mona Island, Puerto Rico; from well 30 feet deep at "El Molino," about 1 mile southeast of NYA camp at Sardinera; October 11, 1953; collected by Merle L. Kuns; U. S. Nat. Mus. no. 96325.

Paratypes.—Four females; same locality as

holotype. Three females; old concrete water catchment basin on high plateau of Mona Island; January 1, 1951; collected by N. T. Mattox.

Description.—Carapace smooth and unarmed. Rostrum (Fig. 1*a–b*) short and triangular, falling far short of the tips of the eyes.

Abdomen smoothly rounded; margins of all pleura rounded, not angulate. Telson (Fig. 1*c*) about two and one half times as long as wide and armed typically with two pairs of dorsal spines and four pairs of terminal ones; a median pair of short setae is set between the two sets of terminal spines.

Eyes rounded triangular in dorsal view (Fig. 1*b*), with a small pigment spot on anterolateral margin.

Antennular peduncle (Fig. 1*a–b*) with a sharp stylocerite which falls slightly short of the end of the segment. Flagella subequal, slightly longer than carapace.

Antennal scale (Fig. 1*b*) extending beyond antennular peduncle; outer spine minute. Antennal flagellum nearly twice as long as antennular flagella.

The mouth parts are shown in Figs. 1*d–i*. Third maxilliped (Fig. 1*i*) reaching beyond antennal peduncle by nearly entire length of terminal segment.

The first, third, fourth, and fifth legs are shown in Figs. 1*j–m*. The second pair of legs was lacking in all specimens available. First four legs with well-developed exopods; that on fifth minute.

Gill series consists of five pairs of pleurobranchiae, one to each pair of legs, a pair of arthrobranchiae on third maxillipeds, and well-developed epipods on all but last pair of legs.

Size.—The holotype has a carapace length of 3.8 mm from the posterior margin of the orbit to the hind margin of the carapace. The carapace lengths of the female paratypes vary from 3.8 to 4.5 mm.

Biology.—The presence of this shrimp in a partially covered concrete water catchment basin is difficult to account for. This basin apparently has no connection with any subterranean water system; in fact, no underground passages are known in the high central mesa of Mona Island, although there are extensive ones through the low coastal plateau. At the time this collection was made, two specimens of a species of the *Olfersii* group of the large fresh-water shrimp *Macrobrachium* were found in the same tank; specific identification of these specimens was not possible because both lacked the large second chelae. A careful search of this locality in 1953 by Merle L. Kuns failed to reveal specimens of either of these shrimps.

Remarks.—*Typhlatya monae* closely resembles *T. garciai* Chace from a cave at Banes, Oriente Province, Cuba. It differs from that species in the nearly complete suppression of the exopod on the fifth leg, the broader telson, and slight differences in the form of the mouth parts. In the reduction of the last thoracic exopod, *T. monae* agrees with *T. pearsei* Creaser from caves in Yucatán, but in all other respects it seems more closely allied to *T. garciai*.

Palaemonetes (Palaemonetes) cummingi, n. sp.
Fig. 2

Holotype.—Female; Squirrel Chimney, Alachua County, Fla.; July 11, 1953; collected by Robert B. Cumming; U. S. Nat. Mus. no. 95795.

Description.—Rostrum (Fig. 2*a*) reaching about to end of antennular penducle, armed dorsally with six nearly equidistant teeth, the posterior one set behind level of orbital margin, and ventrally with three teeth. Carapace with a broad hump behind middle of dorsal margin. Integument firm. Antennal spine small but sharp and distinct. Branchiostegal spine similar in size to antennal, placed just below distinct branchiostegal groove, and reaching well beyond anterior margin of carapace.

Abdomen normal. All pleura rounded, that of fifth somite narrowed posteriorly but not acute. Sixth somite as long as telson exclusive of terminal spines. Telson (Fig. 2*c*) armed with an asymmetrically disposed pair of dorsal spines placed well behind the middle. Tip of telson (Fig. 2*d*) terminating in a sharp point and apparently armed with three pairs of spines and a median pair of plumose setae; the outer pair of spines obviously represents the posterior dorsal pair which has moved distally so far as to seem to form part of the terminal series.

Eyes (Fig. 2*a–b*) unpigmented, but the small, hemispherical cornea is distinguished from the much broader stalk.

Antennular peduncle (Fig. 2*b*) with a small, sharp stylocerite. Anterolateral spine of basal segment reaching barely beyond convex anterior margin of segment. Upper antennular flagellum four times as long as carapace, its two rami fused for about 16 joints; free portion of outer ramus

consisting of three or four joints and less than one third as long as fused portion. Lower antennular flagellum about three times as long as carapace.

Antennal scale (fig. 2*b*) about two and one half times as long as broad. Outer margin nearly straight. Distal tooth falling far short of end of blade. Antennal flagellum more than five times as long as carapace.

The mouth parts are shown in Figs. 2*f–k*. Third maxilliped (Fig. 2*k*) reaching to end of antennal peduncle.

First leg (Fig. 2*l*) reaching beyond antennal scale by about the length of the fingers. Fingers nearly half again as long as palm; cutting edges entire and closing throughout their lengths. Palm distinctly longer than high and bearing a row of stout curved setae on proximal half of outer lower margin. Carpus 1.8 times as long as chela and bearing a V-shaped brush of setae near distal end of lower margin. Merus 0.9 times as long as carpus, ischium half as long as merus. Second leg (Fig. 2*m*) longer than first, reaching beyond antennal scale by nearly entire length of chela. Fingers slightly shorter than palm; cutting edges entire and meeting throughout their lengths, except near base of fingers where a concavity in cutting edge of fixed finger leaves a narrow gap. Carpus a little more than one and one fourth times as long as chela. Merus about three fourths as long as carpus, ischium slightly longer than merus. Third leg (Fig. 2*n*) reaching beyond antennal scale by about one half of

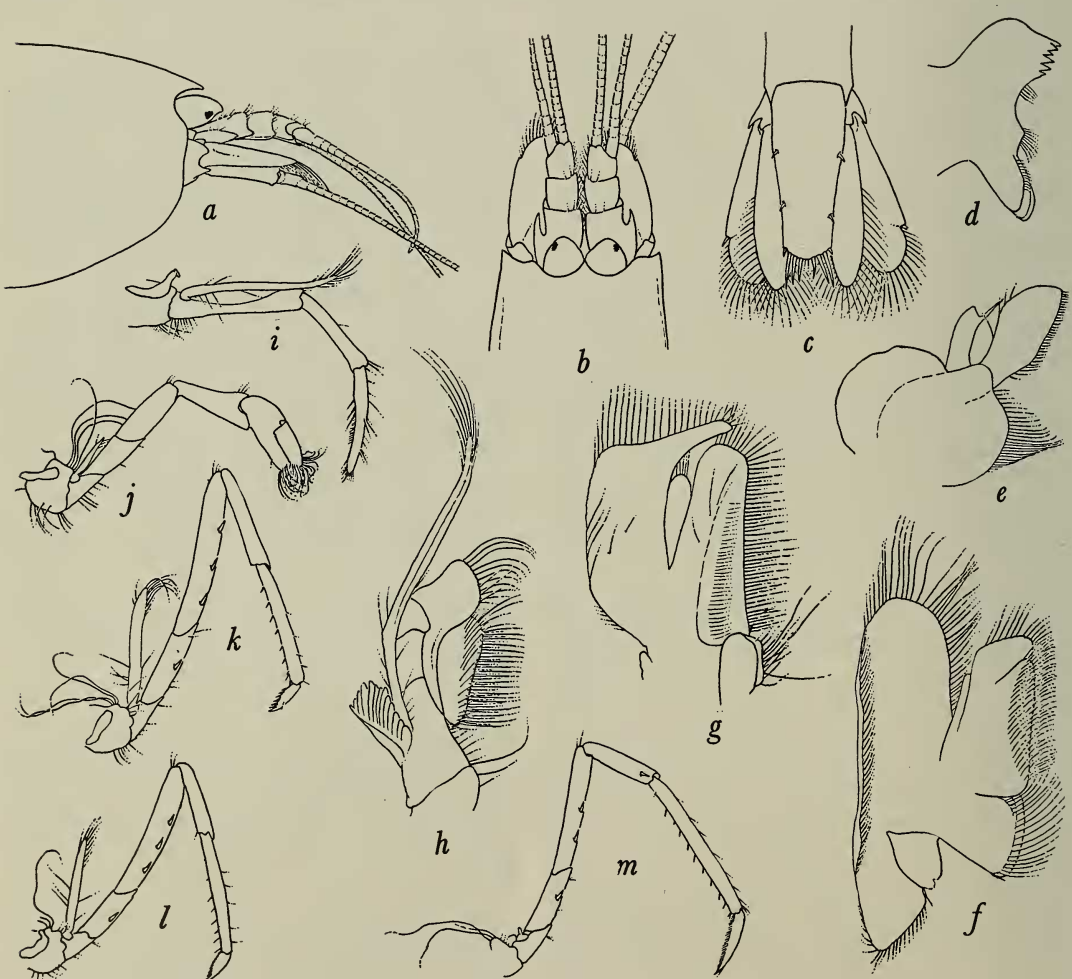

FIG. 1.—*Typhlatya monae*, n. sp.: *a*, Frontal part in lateral view; *b*, frontal part in dorsal view; *c*, telson and uropods in dorsal view; *d*, right mandible; *e*, right first maxilla; *f*, right second maxilla; *g*, right first maxilliped; *h*, right second maxilliped; *i*, right third maxilliped; *j*, right first leg; *k*, right third leg; *l*, right fourth leg; *m*, right fifth leg. *a–i*, *k–m*, female holotype; *j*, female paratype. *a–c*, *i–m*, × 12.5; *d*, × 36.6; *e–h*, × 27.3.

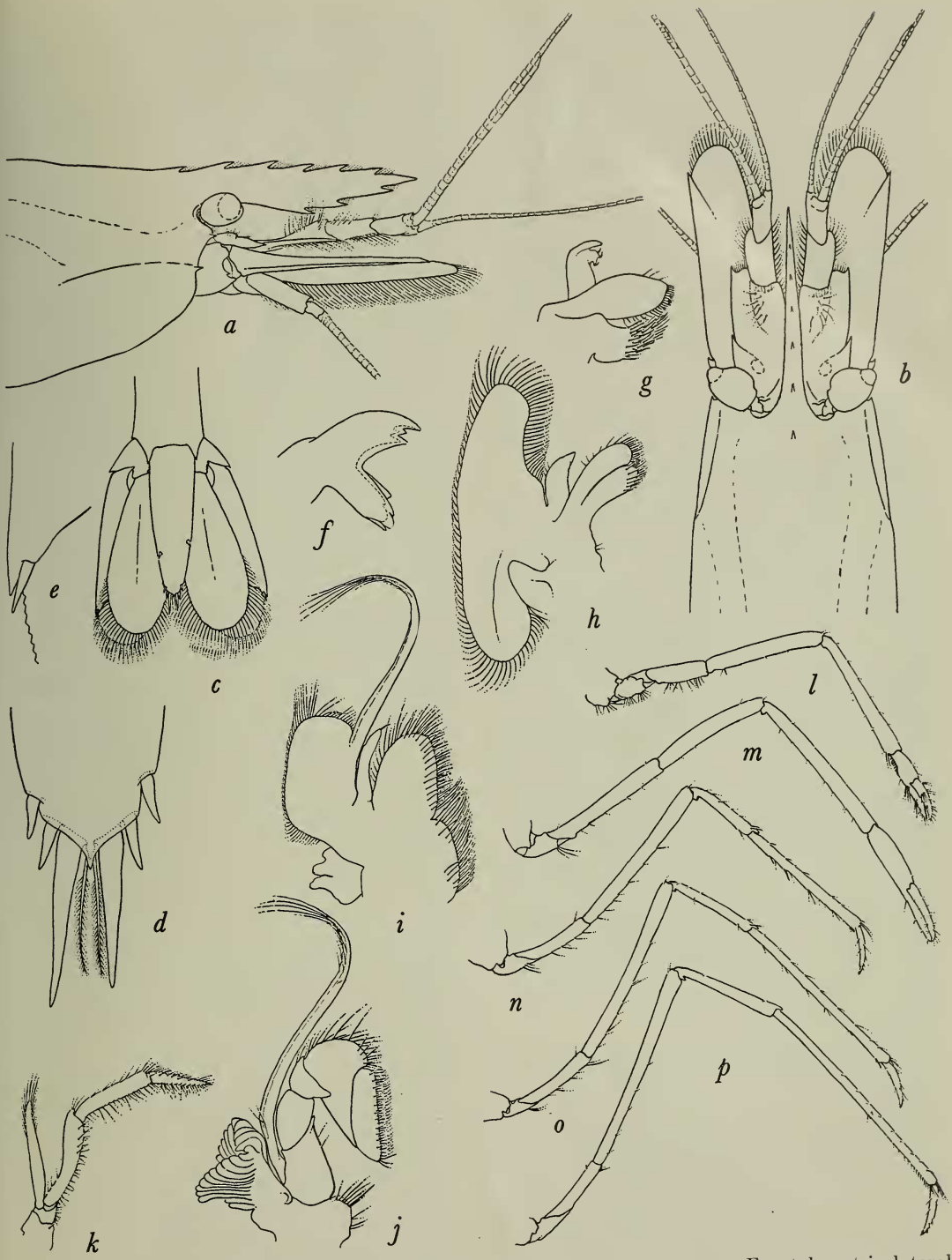

Fig. 2.—*Palaemonetes* (*Palaemonetes*) *cummingi*, n. sp., female holotype: *a*, Frontal part in lateral view; *b*, frontal part in dorsal view; *c*, telson and uropods in dorsal view; *d*, tip of telson in dorsal view; *e*, lateral angle of outer uropod; *f*, right mandible; *g*, right first maxilla; *h*, right second maxilla; *i*, right first maxilliped; *j*, right second maxilliped; *k*, right third maxilliped; *l*, right first leg; *m*, right second leg; *n*, right third leg; *o*, right fourth leg; *p*, right fifth leg. *a–c*, *k–p*, × 5.9; *d*, *e*, × 34.2; *f–j*, × 12.8.

dactyl. Propodus 2.8 times as long as dactyl, 1.4 times as long as carpus, and 0.8 times as long as merus. Fourth leg (Fig. 2*o*) reaching beyond antennal scale by dactyl and distal fourth of propodus. Propodus 3.8 times as long as dactyl, about twice as long as carpus, and about as long as merus. Fifth leg (Fig. 2*p*) reaching beyond antennal scale by dactyl and one third of propodus. Propodus nearly four and one half times as long as dactyl, about twice as long as carpus, and a little more than 1.1 times as long as merus.

Pleopods and uropods of usual shape. Outer branch of uropods with a movable spine on inner side of fixed tooth at end of outer margin (Fig. 2*e*).

Size.—The holotype is somewhat more than an inch long. The carapace measures 6.9 mm from the level of the posterior margin of the orbit to the hind margin of the carapace.

Color.—The collector, Robert B. Cumming, has furnished the following color notes on the specimens in life: "This shrimp was completely colorless and translucent with the exceptions noted below. There was no suggestion of any general body color except white and this was a mere suggestion. There was an organ in the dorsal portion of the cephalothoracic region which was a vivid pea green in color. This looked like an egg mass. It resembled a miniature mass of English peas with each 'pea' just under a millimeter in diameter. The gills or something in the gill region was red in color. There was not much red color and it was somewhat diffused coming through the carapace. There was a small black spot just cephalad to the green mass mentioned above when the animal was caught, but when the shrimp fed extensively on liver several days after its capture, the spot became larger and red and sometime later it became invisible."

Biology.—"Squirrel Chimney," the type locality of this species, is described by Hobbs (1942, p. 147) as "a circular solution cavity with almost vertical walls, the latter supporting a luxuriant growth of liverworts, mosses, and small ferns. This chimney penetrates the surface soil and limestone to a depth of approximately 50 feet, where it strikes subterranean water. Debris has fallen into the sink and has accumulated at the water level so that a little less than half of the bottom area is open water, the rest of it being covered with fallen leaves which are supported by dead tree trunks and limbs. Within six to eight feet of the bottom a small opening about three feet in diameter leads out into a fissure about 25 yards long and four feet wide, the whole bottom of which is filled with water ranging in depth from a few inches to 30 feet at the deepest place sounded. The light is very dim inside of the fissure, and a short distance inside of it, it is completely dark. The water is very clear, but the surface film sometimes supports a coat of fine silt and debris. The bottom consists of mud, sand, and silt, with large limerock outcrops."

Mr. Cumming has also supplied the following notes on the occurrence and habits of this shrimp. "The shrimp was taken . . . while I was swimming in open water in the fissure at Squirrel Chimney. It was not very near a wall when first seen but swimming freely. It was taken in association with [the crayfishes] *Troglocambarus maclanei* Hobbs and *Procambarus pallidus* (Hobbs) [and also a white amphipod, probably *Crangonyx hobbsi* Shoemaker]. Another trip was made on July 15, 1953, in an attempt to catch more specimens of shrimp. I swam but saw no animals of any sort. I then set traps baited with liver (the captive specimen seemed to like liver). As I was about to leave, dressed and with all of the equipment placed in a bag, I saw a shrimp swimming in open water right down the center of the fissure about 2 inches below the surface. I tried rapidly to get a mask and sieve out of the tied bag and was ready to go in with my clothes on, but the shrimp seemed sensitive to our lights, and arriving at a spot right below us, dove straight down out of sight. The only animal we saw on the 15th was a shrimp. I returned to Squirrel Chimney on the 17th of July to swim and examine the traps. Swimming, I saw many specimens of *P. pallidus* but nothing else. The traps contained a few specimens of *P. pallidus* and that was all. [Subsequently five more specimens were seen in July and early August but they all eluded capture.]

"The shrimp seemed much more at home in an aquarium than cavernicolous crayfish taken on the same day at the same locality. The shrimp swam freely about the aquarium much of the time, but it also rested frequently on the bottom. It sometimes would hang on the air hose near the surface of the water, a habit it shared with *T. maclanei* but not *P. pallidus*. The shrimp fed readily on bits of raw liver, having no difficulty in discovering the food and showing no hesitation in feeding as soon as it was discovered. This was not true of the crayfish."

Remarks.—This is apparently the first blind species of the subgenus *Palaemonetes* to be discovered. It approaches *Palaemonetes* (*Alaocaris*) *antrorum* Benedict from subterranean waters near San Marcos, Texas, in the unpigmented eyes, the armature of the telson, and the elongate appendages. It shows a close relationship to the typical subgenus and differs from the subgenus *Alaocaris*, however, in the firm integument, the form of the rostrum, the position of the branchiostegal spine, the dissimilarity between the first two pairs of legs, and the presence of a movable spine, in addition to the fixed tooth, at the outer angle of the outer branch of the uropods.

It was hoped that additional specimens might be obtained before this species was described, but the description of the species from a single specimen seems to be justified because it is so distinct from all other known species of the genus. Perhaps this record of this interesting species, the first cavernicolous shrimp to be found east of the Appalachians, will lead to the discovery of other specimens.

It is a pleasure to name this species for the collector, Robert B. Cumming. Our knowledge of invertebrate animals can be greatly enhanced by observers who display the interest and determination shown by Mr. Cumming.

KEY TO THE AMERICAN SUBTERRANEAN SHRIMPS

1. Fingers of chelate legs with dense terminal brushes of long hairs. Exopods on some or all legs. (Atyidae.) 2
   Fingers of chelae only sparsely setose. Legs without exopods 5
2. Rostrum extending beyond end of antennular peduncle and armed with small, movable spines. Carapace armed with three pairs of spines (supra-ocular, antennal, and pterygostomian) ..*Palaemonias ganteri* Hay, 1901. Mammoth Cave, Ky.
   Rostrum unarmed and not extending as far as end of antennular peduncle. Carapace completely unarmed. (*Typhlatya*) 3
3. Rostrum reaching nearly as far as distal end of second antennular segment. Epipods biflagellate ..*Typhlatya pearsei* Creaser, 1936. Caves in Yucatán.
   Rostrum not reaching as far as tips of eyestalks. Epipods simple, straplike 4
4. Exopod on fifth leg nearly as long as those on preceding legs. Telson three times as long as wide .....*Typhlatya garciai* Chace, 1942. Cave at Banes, Oriente Province, Cuba.
   Exopod on fifth leg rudimentary. Telson two and one half times as long as wide *Typhlatya monae* (see above). Mona Island, Puerto Rico.
5. Carpus of second legs multi-articulate. (Hippolytidae.) Rostrum armed with four to six teeth above and two to four below. Eyes pigmented. Carpus of second legs composed of 26 to 32 segments; merus of 12 to 17 *Barbouria cubensis* (von Martens, 1872). Cave between Morro Castle and Cojimar, Cuba (possibly extinct).
   Carpus of second legs not subdivided. (Palaemonidae.) 6
6. Rostrum laterally compressed, reaching at least as far as end of second antennular segment. Branches of outer antennular flagellum fused at base. (Palaemoninae.) 7
   Rostrum dorsally flattened, not reaching as far as end of first antennular segment. Branches of outer antennular flagellum not fused at base. (Euryrhynchinae.) 13
7. Two spines on or near anterior margin of carapace, one antennal, one branchiostegal 8
   Not more than one pair of spines near anterior margin of carapace, branchiostegal absent. (*Troglocubanus.*) 10
8. No branchiostegal groove on anterolateral surface of carapace. Mandible with 2-jointed palp .....*Creaseria morleyi* (Creaser, 1936). Caves in Yucatán.
   Branchiostegal groove present. Mandible without palp. (*Palaemonetes.*) 9
9. Rostrum armed with teeth on both margins. Two pairs of chelipeds different in size and shape. A movable spine at inner margin of terminal tooth of outer branch of uropod *Palaemonetes* (*Palaemonetes*) *cummingi* (see above). Alachua County, Fla.
   Rostrum unarmed ventrally. Both pairs of chelipeds similar in size and shape. No movable spine at inner margin of terminal tooth of uropod *Palaemonetes* (*Alaocaris*) *antrorum* Benedict. Subterranean waters at San Marcos, Tex.
10. Rostrum unarmed dorsally, or with a minute tooth near apex. An acute angle but no sharp spine below orbit *Troglocubanus inermis* (Chace, 1943). Cave in Havana Province, Cuba.
    One or more teeth on dorsal margin of rostrum or carapace. A sharp antennal spine below orbital angle 11
11. A single dorsal tooth on carapace behind base of rostrum. Lower margin of rostrum straight or concave *Troglocubanus calcis* (Rathbun, 1912). Cave in Havana Province, Cuba.
    Two or more teeth on dorsal margin of rostrum; lower margin convex 12
12. Rostrum not reaching beyond antennular peduncle, armed with two or three dorsal teeth. *Troglocubanus gibarensis* (Chace, 1943). Well entering underground stream in Oriente Province, Cuba.
    Rostrum reaching as far as, or beyond, end of

antennal scale, armed with six to eight dorsal teeth

Troglocubanus eigenmanni (Hay, 1903). Caves in Pinar del Río, Havana, and Matanzas Provinces, Cuba.

13. Rostrum reaching beyond eyes. Second chelipeds with two spines on merus and one on carpus

Euryrhynchus burchelli Calman, 1907. Well at Pará, Brazil.

Rostrum not reaching beyond eyes. Second chelipeds without meral or carpal spines

Euryrhynchus wrzesniowskii Miers, 1877. Wells and heavily shaded pools and creeks in British, Dutch, and French Guiana.

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ZOOLOGY.—*Geographical distribution and means of dispersal of the bathypelagic nemerteans found in the great submarine canyon at Monterey Bay, California.* Wesley R. Coe, Scripps Institution of Oceanography.[1] (Communicated by Fenner A. Chace, Jr.)

The bathypelagic nemerteans, which are specially adapted for life in the intermediate depths of the oceans, have been found as sparse populations in all the oceans except the Arctic north of the continents. They occur most frequently at depths of 600 to 2,000 meters, and consequently their environmental conditions show relatively little variation throughout the oceans. Since many of them are believed to be transported by deep ocean currents, information concerning their known geographical distribution is of interest to both biologists and oceanographers.

In most of the bathypelagic species the body is flattened horizontally, with much gelatinous parenchyma separating the internal organs, while in some species the specific gravity is further decreased by lipoid globules in the digestive systems. Because of the density and high viscosity of the water due to low temperature and great pressure, the worms are enabled to maintain their positions with a minimum of muscular effort. Most of the species have only feeble musculatures and many of them are presumably carried passively, with slowly undulating movements, throughout the oceanic systems in the currents and eddies which they are thought to inhabit.

Relatively little is known as to the direction and velocity of these currents, although Coe (1945, 1946) has published, with the cooperation of Dr. H. U. Sverdrup, a chart of the principal known currents of the North Atlantic at the depths inhabited by the nemerteans. The available evidence indicates that these currents have an average velocity of about 1 mile in 4 days or 90 miles per year. Comparable currents in the Pacific are even less well known although their existence is fully established.

Some of the individuals recently found in the great canyon prove to be specifically identical with those of well-known species of the Atlantic, and it must have required a very long time for their ancestors to be carried from one of these oceans to the other. It should be recalled, however, that in the late Triassic era the Atlantic and Pacific had a broad connection between North and South America.

[1] Contribution from the Scripps Institution of Oceanography, new series.